

Operating instructions

LAUDA Compact Low-temperature thermostats
RL 10 CH

valid from serie X 10
05/02
YACE 0053

LAUDA DR. R. WOBSE
GMBH & CO. KG
P.O. Box 1251
97912 Lauda-Königshofen
Phone: (+49) (0)9343/ 503-0
Fax: (+49) (0)9343/ 503-222
E-mail [info @ lauda.de](mailto:info@lauda.de)
Internet <http://www.lauda.de>

1	BRIEF OPERATING INSTRUCTIONS	4
1.1	Fit the hoses to the pump connections:	4
1.2	Operational safety	4
1.3	Note	4
2	TECHNICAL DATA (TO DIN 58966)	5
3	GENERAL CONSTRUCTION AND TECHNICAL DESCRIPTION	7
3.1	Operating principle	7
3.2	Materials	7
3.3	Pump	7
3.4	Refrigeration system	8
4	OPERATION SAFETY AND WARNING NOTES	10
4.1	General information	10
4.2	Warning notes	10
4.2.1	Temperatures	10
4.2.2	Mains connection	10
4.2.3	Fume extraction	10
5	BATH LIQUIDS AND HOSE CONNECTIONS	11
5.1	Bath liquids	11
5.2	Hose connections	12
6	UNPACKING, ASSEMBLY AND SETTING UP	13
6.1	Unpacking	13
6.2	Setting up	13
7	CONNECTION OF EXTERNAL SYSTEMS	14
7.1	Closed external circuits	14
8	STARTING UP	15
8.1	Filling	15
8.2	Connection to supply	15
9	MAINTENANCE	15
9.1	Safety notes in case of repairs	15
9.2	Repairs	15
9.3	Maintenance of the refrigeration system	15
9.3.1	Repair and disposal of refrigerant	16
9.4	Cleaning	16
9.5	Spares ordering	16

1 Brief operating instructions

Even if you find these brief instructions initially sufficient please read the following sections, especially Section 4: "Safety devices and warning notes".

For safe operation of the equipment it is essential that the information in these Operating Instructions is observed.

Check thermostat and accessories during unpacking for any transport damage and if necessary inform the carrier or the postal authority.

Assemble the unit according to Section 6 and add extra items as appropriate.

1.1 *Fit the hoses to the pump connections:*

Without external system: for improved circulation within the bath remove the closing plugs from the two pump connections, fit the tubing nipples and link them together with Perbunan tubing (120°C max.) or a metal hose.

With external system: make the hose connections to the external system.

Secure hoses with hose clips against slipping off.

Use only LAUDA bath liquids (Section 5). Fill the unit up to about 2 cm below the cover plate.

Check the supply voltage against the details on the label. Insert the mains plug.

Switch on the unit with the mains switch (green lamp lights up). The internal bath temperature is indicated at the digital display.

After a longer standstill period of the refrigeration unit it can take up to approx. 20 minutes - depending on ambient temperature and type of the unit - until the nominal cooling capacity is available.

When connecting up an external system, ensure that the level in the thermostat does not fall more than permitted.

1.2 *Operational safety*

The thermostat must only be used with inflammable liquids or only with those flammable bath liquids whose flashpoint is more than 25°C above the operating temperature. Otherwise there is danger of an explosive atmosphere.

1.3 *Note*

The outflow and return pipes of the pumps reach the operating temperature. Don't touch at low temperatures!

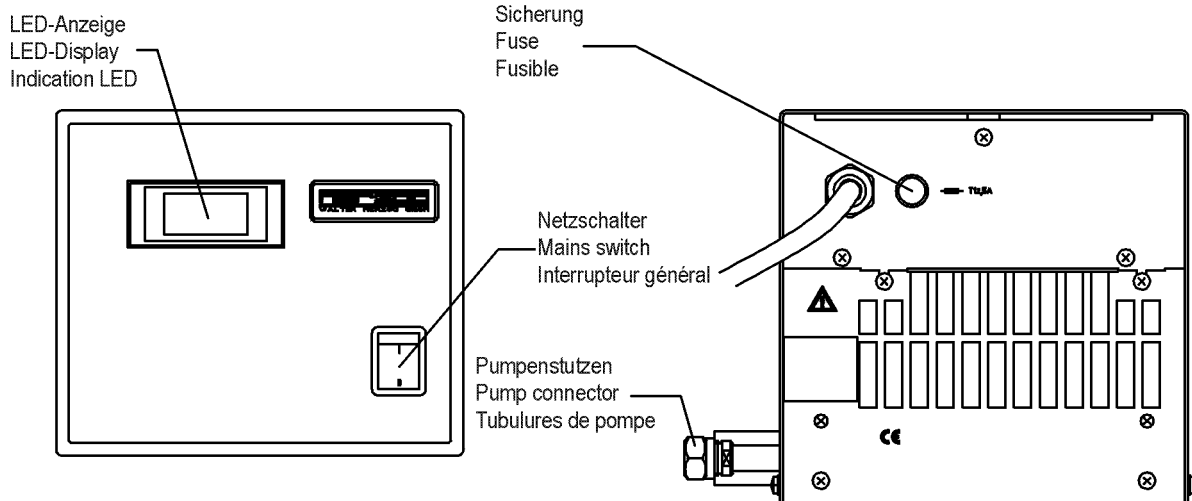
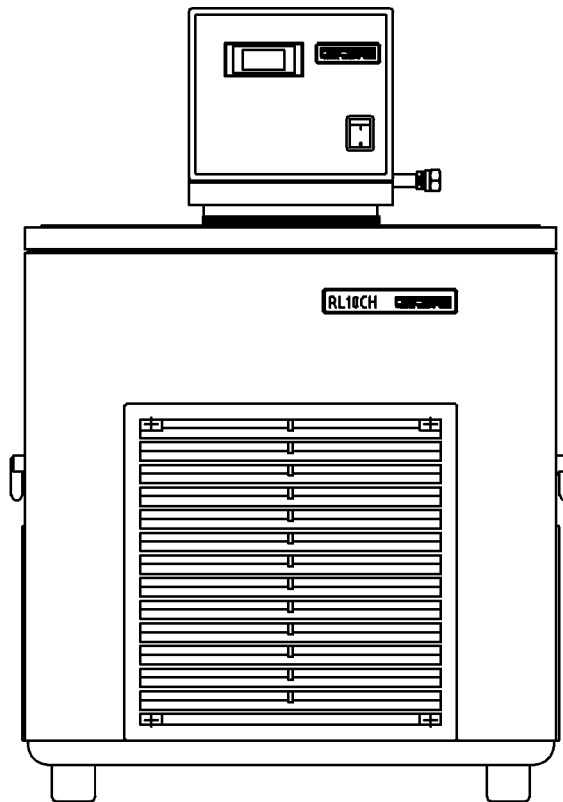
The pump only starts to run when the 2nd stage of the cooling unit starts that means when the liquid cooling is effective.

2 Technical Data (to DIN 58966)

Type			RL 10 CH
Operating temperature range		(°C)	down to -80
Ambient temperature range		(°C)	5 to 35
Temp. measurement / Resolution		(°C)	digital with green LED, 1°C resolution
Temperature probe			Pt 100 Class B DIN IEC 751
Cooling capacity (eff.)	20°C	(KW)	0.45
	-50°C		0.25
	-70°C		0.17
	-80°C		0.09
<u>Simplex pump</u>			
Pump output against zero head		(l/min)	22
max. Pump pressure		(bar)	0.5
Filling volume		(L)	8...11
Bath opening (W x D)		(mm)	120x105
Bath depth		(mm)	190
Usable liquid depth		(mm)	150
Overall size (WxDxH)		(mm)	495x615x740
Weight		(Kg)	98
Power supply		(V;Hz)	230;50/60 Protection class 1 to VDE 106-1
Leistungsaufnahme ohne Zubehör max.		(kW)	1.2
			Units conform to EU Guideline 89/336/EEG (EMC) and 73/23/EEG (low-voltage) and carry the CE mark (50Hz units).
Cat-No.			
230V; 50/60Hz			LSO 0079

Units with different voltages may have a different loading (see unit label)!

Technical changes reserved !



3 General construction and technical description

3.1 *Operating principle*

Laboratory thermostats operate with liquids (operating medium, heat transfer oil) which serve for energy transfer to the product to be thermostated.

The thermostated products can be immersed in the thermostatic bath (bath thermostat), or placed in an external open bath whose liquid is circulated by the pump of the thermostat. When operating as circulator the thermostatic liquid is pumped through an external heat exchanger arranged by the user in which a product is being thermostated.

The unit RL 10 CH is a low-temperature thermostat that does not have any temperature control. After switch-on it works with maximum cooling capacity.

3.2 *Materials*

All materials in contact with the bath liquid are made from high-grade stainless steel or materials of similar anti-corrosion properties. Materials of PTFE and PETP are also used in the thermostats Series RL.

3.3 *Pump*

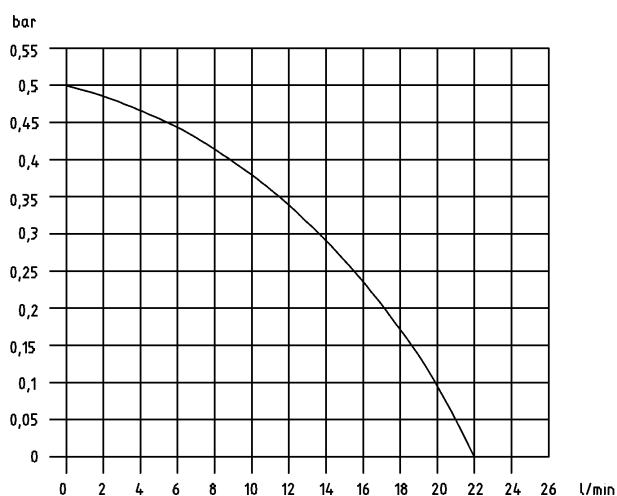
The RL 10 CH is equipped with a centrifugal pressure pump. This can be used to operate closed external systems (reactors).

The pump switches on automatically if the 2nd stage of the cooling aggregate starts, that means the green signal lamp "Cooling" lights up. The pump is driven by an external rotor motor.

The pumps operate perfectly up to a viscosity of approx. 30 mm²/s, with the pump output decreasing rapidly with increasing viscosity.

Pump characteristic

230 V; 50 Hz



3.4 **Refrigeration system**

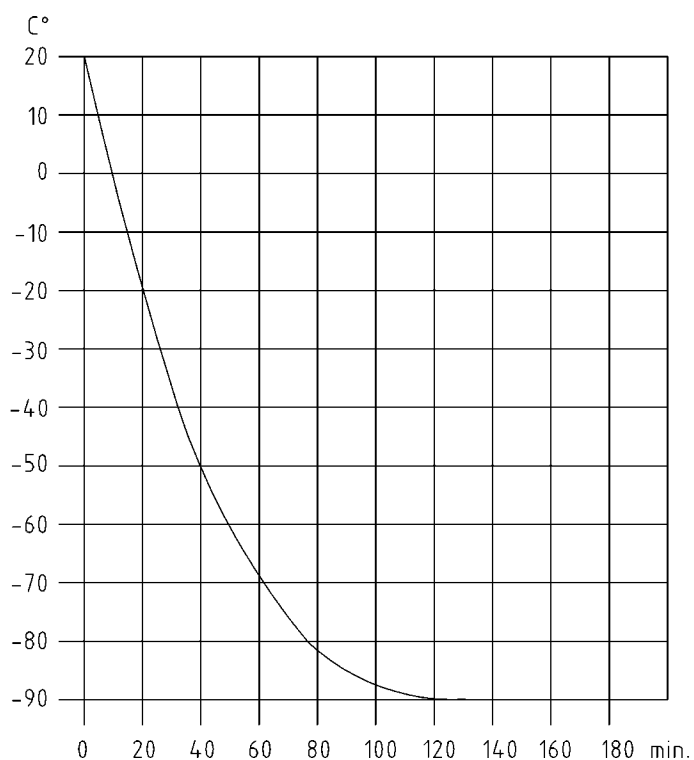
The refrigeration system consists of a two-circuit cascade with electronic starting control of the low-temperature stage. The condensation and motor heat is dissipated through a fan-cooled finned tube condenser. Fresh air is drawn in at the front, heated and discharged at the back and the sides. To ensure problem-free air circulation the ventilation openings must not be restricted.

The compressors are fitted with a temperature monitor which responds to the compressor temperature and its current take-up. The cooling system is additionally protected against excessive pressure by a pressure monitor.

The refrigeration system consists of a two-circuit cascade with electronic starting control of the low-temperature stage.

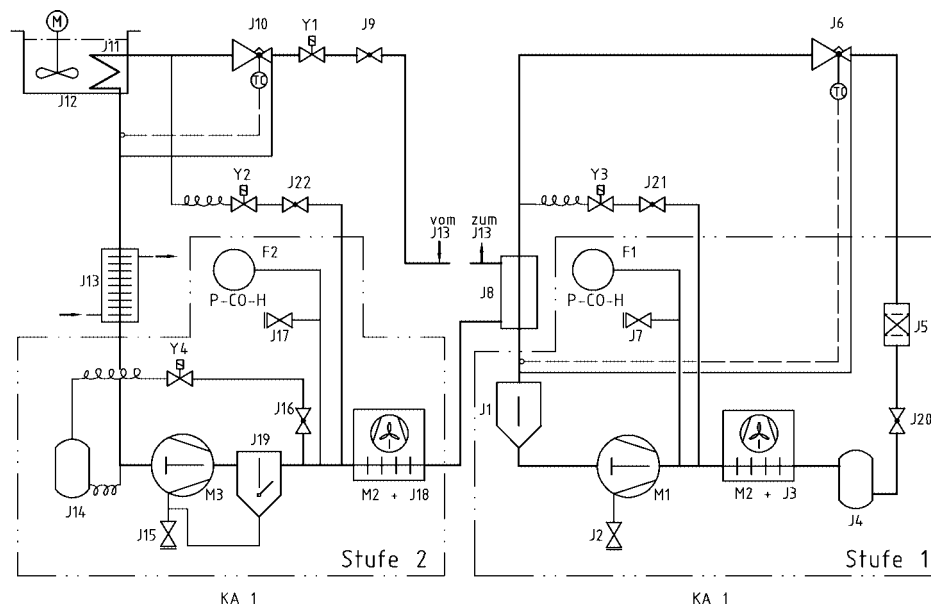
At the green signal lamp "Cooling" can be observed if the cooling of the bath liquid is effective.

Cooling diagram



Cooling circuit

RL



F1	Überdruckschalter Stufe 1	Overpressure switch stage 1	Disjoncteur de surpression étage 1
F2	Überdruckschalter Stufe 2	Overpressure switch stage 2	Disjoncteur de surpression étage 2
J1	Flüssigkeitsabscheider	Liquid separator	Séparateur de liquide
J2	Kontrollventil Saug Stufe 1	Control valve suction stage 1	Vanne de contrôle aspiration étage 1
J3	Kondensator Stufe 1	Condenser stage 1	Condensateur étage 1
J4	Sammelflasche	Receiver	Receveur
J5	Filtertrockner	Filter drier	Déshydrateur
J6	Expansionsventil Stufe 1	Expansion valve stage 1	Vanne d'expansion étage 1
J7	Kontrollventil Druck Stufe 1	Control valve pressure stage 1	Vanne de contrôle pression étage 1
J8	Wärmetauscher	Heat exchanger	Echangeur thermique
J9, J16, J20, 21, 22	Absperrventil	Shut-off valve	Vanne d'arrêt
J10	Expansionsventil Stufe 2	Expansion valve stage 2	Vanne d'expansion étage 2
J11	Verdampfer	Exchanger	Echangeur
J12	Flüssigkeitsbad	Liquid bath	Bain de liquide
J13	Wärmetauscher	Heat exchanger	Echangeur thermique
J14	Druckausgleichsbehälter	Surge vessel	Réservoir d'égalisation de pression
J15	Kontrollventil Saug Stufe 2	Control valve suction stage 2	Vanne de contrôle aspiration étage 2
J17	Kontrollventil Druck Stufe 2	Control valve pressure stage 2	Vanne de contrôle pression étage 2
J18	Kondensator Stufe 2	Condenser stage 2	Condensateur étage 2
J19	Ölabscheider	Oil separator	Séparateur d'huile
M1	Kompressor Stufe 1	Compressor stage 1	Compresseur étage 1
M2	Ventilator	Fan	Ventilateur
M3	Kompressor Stufe 2	Compressor stage 2	Compresseur étage 2
Y1	Magnetventil Kühlen Stufe 2	Solenoid valve Cooling stage 2	Vanne solenoide refroidissement étage 2
Y2	Magnetventil Heizen Stufe 2	Solenoid valve Heating stage 2	Vanne solenoide chauffage étage 2
Y3	Magnetventil Heizen Stufe 1	Solenoid valve Heating stage 1	Vanne solenoide chauffage étage 1
Y4	Magnetventil Druckausgleich	Solenoid valve pressure compensation	Vanne solenoide compensation de pression

4 Operation safety and warning notes

4.1 General information

The thermostat must only be used with inflammable liquids or only with those flammable bath liquids whose flashpoint is more than 25°C above the operating temperature (EN 61010).

Warning: The units must only be used according to the descriptions indicated in the operating instructions. This also means that they must only be used by qualified staff being well informed. The units must not be used for applications in the medical field according to EN 60601-1 or IEC 601-1!

4.2 Warning notes

4.2.1 Temperatures

The flow and return pipes of the pumps reach the operating temperature. Don't touch at low temperatures!

4.2.2 Mains connection

Connect the unit only to mains sockets with protective earth contact (PE)!

4.2.3 Fume extraction

Depending on the bath liquid used and the operating method there is a possibility that toxic vapours may be produced. In that case it is necessary to provide appropriate fume extraction. Pull out the mains plug before cleaning the bath with solvents. Provide appropriate fume extraction. Before starting up the unit it is absolutely essential to ensure that the bath contains no explosive mixture. If necessary purge it with nitrogen!

5 Bath liquids and hose connections

The operating ranges specified for the bath liquids are for general information only and may be restricted through the operating temperature range or safety requirements specified in the appropriate standards (see Section 4.1).

5.1 Bath liquids

LAUDA Designation		Working temperature range	Chemical Designation	Viscosity (kin)	Viscosity (kin) at Temperature	Fire-point	Ref.No. Quantity		
	Former designation	from °C to °C	at 20°C	mm ² /s	mm ² /s		5 l	10 l	20 l
Kryo 85	Ultra-Therm XLT	-85...+30	Silicone oil	1.76	17 at -80°C	> 56	LZB 113	LZB 213	LZB 313



- When selecting bath liquids it should be noted that performance must be expected to worsen at the lower limit of the operating temperature range due to increasing viscosity. The full operating range should only be utilised if really necessary.
- The operating ranges of the bath liquids and tubing represent general data which may be limited by the operating temperature range of the unit.



Silicone oil causes pronounced swelling of Silicone rubber → never use Silicone oil with Silicone tubing!

Ethyl alcohol


Ethyl alcohol is frequently used for operating temperatures below -60°C.

Warning As the fire point of ethyl alcohol is 12°C the user works outside the standard specifications (see Item 4.2). It is essential that the unit is being operated under continuous supervision.

boiling point	78°C	firepoint	12°C
viscosity at 20°C	1,5 mm ² /s	freezing point	-114°C

DIN safety data sheets are available on request!

5.2 Hose connections

Tubing type	Int. dia. Ø mm	Temperature range °C	Application	Cat. No.
EPDM-tubing insulated	12 ext. dia. 35mm approx	-60...120	For all bath liquids; except Ultra 350 and mineral oils	LZS 021
Silicone tubing, insulated	11 ext. dia. 32 mm approx	-60...100	water, water/glycol mixture	LZS 007
Silikonschlauch insulated	11 ext. dia. 52 mm approx	-100...100	water, water/glycol mixture	LZS 009
 <ul style="list-style-type: none"> – EPDM-tube not for Ultra 350 and mineral oils! – Silicone oil causes pronounced swelling of Silicone rubber → never use Silicone oil with Silicone tubing! – Protect tubing with hose clips against slipping off. 				

Metal hoses with insulation	Tube connection	int. dia (mm)	ext. dia (mm)	Temperature range °C	Length	Ref. No.
MK 50	M 16x1	10	44	-90...150	50	LZM 052
MK 100	M 16x1	10	44	-90...150	100	LZM 053
MK 150	M 16x1	10	44	-90...150	150	LZM 054
MK 200	M 16x1	10	44	-90...150	200	LZM 055
Pump link	M 16x1	10	44	-90...150	20	LZM 045

In case of lower temperatures an additional insulation is necessary on pump link (LZM 045)!

Highly-flexible, thermally insulated stainless steel (V2A) metal hoses with M 16x1 mm connecting thread; int. diam. 10 mm; these hoses offer optimum security.

Further details on thermostatic liquids and hoses can be found in our special publication.

6 Unpacking, assembly and setting up

6.1 Unpacking

Goods are packed carefully, largely preventing transport damage. If unexpectedly some damage is visible on the equipment, the carrier or the postal authority has to be informed so that it can be inspected.

Standard accessories

1 Bath cover	Cat.-No. HDQ 075
2 Nipples 13mm dia.	Cat.-No. HKO 026
2 Screw caps	Cat.-No. HKM 032
2 Closing plugs	Cat.-No. HKN 065

Operating instruction

6.2 Setting up

Set up the unit conveniently so that the control panel is towards the front and ensure that the air circulation for the refrigeration system through the grille in the lower part of the unit is not restricted (a minimum spacing of 50 cm is recommended)

Close the drain cock at the back of the bath!

7 Connection of external systems

7.1 Closed external circuits

Remove the closing plugs by releasing the threaded rings (19 mm a/f) from the flow and return connections and replace them by the tubing nipples (13 mm dia.) supplied.
If the thermostat is connected to closed external circuits, additional liquid must be poured in after the thermostat is switched on until the level in the bath remains at the correct height (approx. 2 cm below top plate).

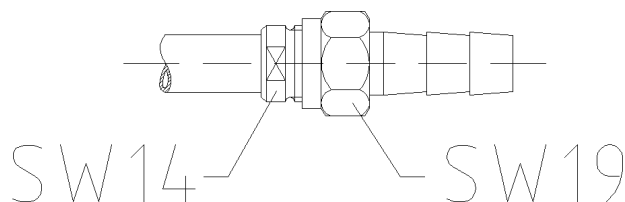
For suitable tubing materials see Section 5.

With external systems at a high level it may happen even in closed circuits that the external volume drains down and the thermostat tank overflows if the pump is stopped and air enters the thermostated system!

Always ensure the maximum possible flow area in the external circuit (nipples, tubing, system). This results in a larger flow and therefore improved thermostatic control.

Always protect tubing with hose clips against slipping off, or use stainless steel hoses with screwed connections.

Note: When tightening the threaded rings (19 mm a/f) at the tubing connections, hold the threaded nipple with a spanner (14 mm a/f) stainless steel hoses with screwed connections!



8 Starting up

8.1 *Filling*

Fill the unit with bath liquid to suit the operating temperature, see Section 5. The filling volume is given under Technical data. In general the thermostat must be filled no higher than 2 cm below the cover plate.

8.2 *Connection to supply*

Connect the unit only to mains sockets with protective earth contact (PE). Compare the details on the label with the mains voltage.

Switch on the unit with the mains switch. The green signal lamp lights up.

Depending on the previous situation/application the low temperature stage only starts working approx. 10 s to 20 min after having switched on the refrigeration.
The actual bath temperature is indicated at the digital display.

9 Maintenance

9.1 *Safety notes in case of repairs*

Always pull out the mains plug during all repair and cleaning operations! Repairs on the control unit with cover removed must only be carried out by a qualified electrician.

9.2 *Repairs*

LAUDA thermostats are largely free from maintenance. Dirty thermostatic liquid should be removed through the drain cock and replaced. If the unit should become faulty it is advisable to return only the faulty module.

The control unit can readily be removed after removing the cover, releasing 2 screws (2 turns) behind the front panel and disconnecting the electrical connections.
The module with pump, heater, temperature probe etc. can also be easily separated from the bath.

There is a fuse T 12,5 A (6,3 x 32) for the complete unit. The fuse being accessible is located at the back side. The green lamp in the mains switch does not flash when the fuse has set off.

In the control unit there is an additional fuse F 0,2 A (5x20).

9.3 *Maintenance of the refrigeration system*

The refrigeration system operates largely without maintenance. If the unit is being operated in a dusty atmosphere we recommend cleaning of the refrigeration system condenser at intervals of 4 to 6 months. This best done with compressed air or nitrogen by blowing for a few minutes into the ventilation openings. If necessary unscrew the front grills.

9.3.1 Repair and disposal of refrigerant

The high-temperature stage of the unit is filled with CFC-free refrigerant R 404 A; its low-temperature stage is filled with CFC-free refrigerant TP 5 R3. Repair and disposal only by a refrigeration specialist (frigorist)!

9.4 Cleaning

The unit can be cleaned using a cloth moistened with water with the addition of a few drops of a (domestic) detergent. No water must find its way into the control unit.

The user is responsible for any necessary decontamination if dangerous materials have been spilled on or inside the unit. This applies in particular if the unit is removed for a different use, for repair, storage etc..

The method of cleaning or decontamination is determined by the expertise of the user himself. If the user has any doubts on whether this may damage the unit he can contact the manufacturer.

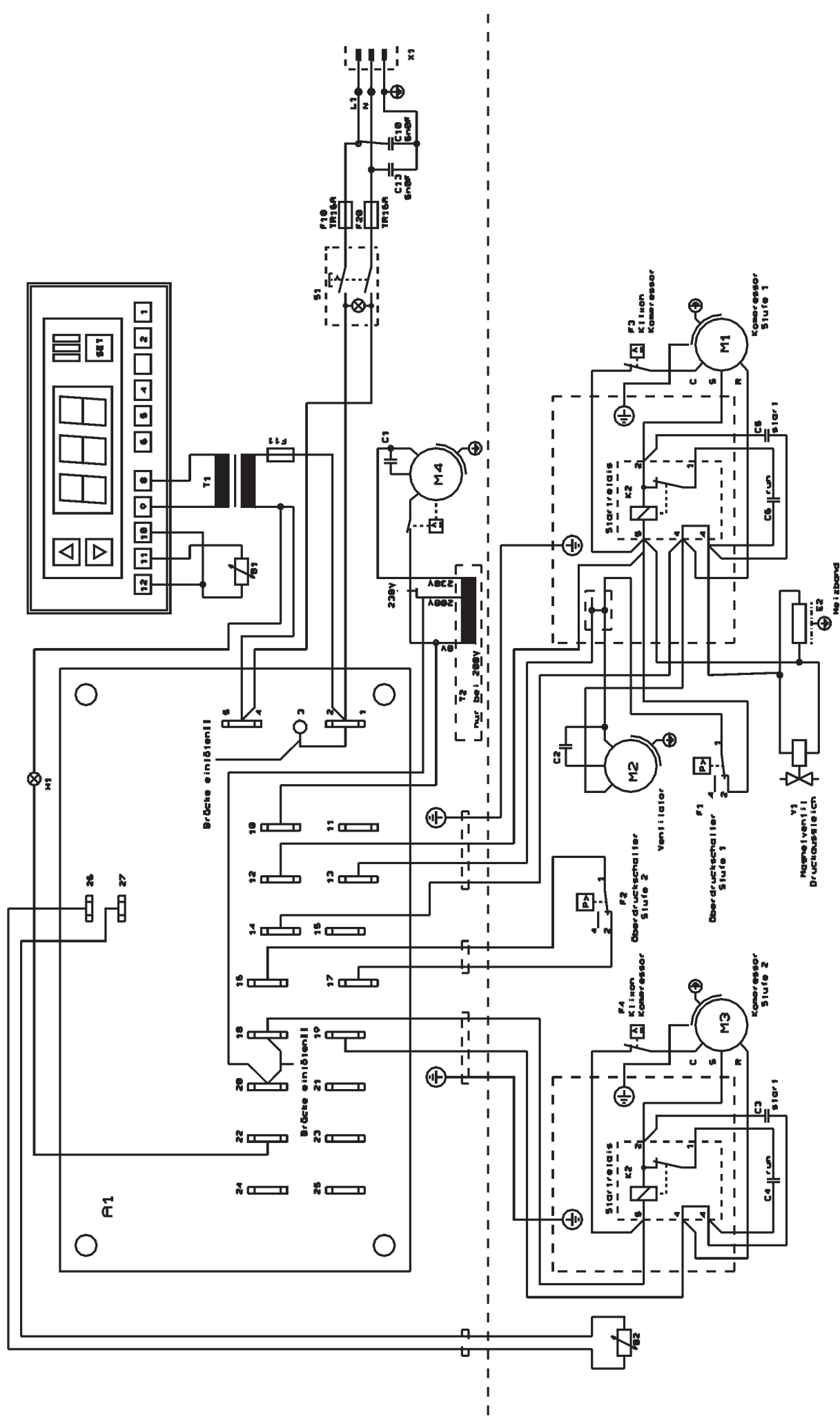
9.5 Spares ordering

When ordering spares please specify the equipment type and number on the label. This avoids queries and prevents supply of incorrect goods!

We shall always be happy to deal with queries, suggestions and complaints.

LAUDA DR. R. WOBSE
GMBH & CO. KG
P.O.Box 1251
97912 Lauda-Königshofen
Phone: (+49) (0) 9343/ 503-0
Fax: (+49) (0) 9343/ 503-222
E-mail [info @ lauda.de](mailto:info@lauda.de)
Internet <http://www.lauda.de>

Für diese Zeichnung behalten wir uns alle nicht ausdrücklich eingeräumten Nutzungsrechte einschließlich der Vervielfältigung und Weitergabe an Dritte vor. Technische Änderungen vorbehalten



				26.06.96				LAUDA		Schaltplan		RL10CH RL10CV RL11CB RL11CI	
				Gepr.f.b.		B. Schwaiger		Dr. R. Huber GmbH & Co KG		Schéma de connexions		230V/50/60Hz	
				Datum				Ersch.f		Circuit diagram		208V/60Hz	
Zusl. Änderungen		Typ		Name		Gepr.f.		Urspr.f.		3		4	
1								2		5		6	
										7		8	
										22.07.1			

Geräteliste Schaltplan
List of parts Circuit diagram
Liste de pièces schéma de connexions
230V;50/60Hz

ab Serie X10

			RL 10 CH	RL 10 CB
A 1	Leiterplatte „Netz“ Printed circuit board „MP-Mains“ Circuit imprimé „MP-Secteur“		UL 276 A	UL 276 A
B 1	Pt100- Fühler Sicherheitskreis Pt100 probe Safety circuit Pt100 sonde Réglage		ETP 047	ETP 047
B 2	Pt100 Fühler Regelung Pt100 probe controller Pt100 sonde réglage		ETP 027	ETP 027
C 1	MKP Kondensator MKP Condenser MKP Condensateur	1,5µF	ECA 012	ECA 012
F 1	Überdruckschalter Stufe 1 Overpressure switch stage 1 Disjoncteur de surpression étage 1		ES 035	ES 035
F 2	Überdruckschalter Stufe 2 Overpressure switch stage 2 Disjoncteur de surpression étage 2		ES 035	ES 035
F 3	Klixon Kompressor Stufe 1 Klixon Compressor stage 1 Klixon compresseur étage 1		-----	-----
F 4	Klixon Kompressor Stufe 2 Klixon Compressor stage 2 Klixon Compresseur étage 2		-----	-----
F 10	Sicherung Fuse Fusible	TR 16 A	EES 013	EES 013
F 11	Steuersicherung Fuse control Contrôle fusible	F0,2A	EEF 002	EEF 002
H 1	Lampe Kühlen Lamp cooling Lampe refroidissement		UD 389	UD 389
M 1	Kompressor Stufe 1 Compressor stage 1 Compresseur étage 1		-----	-----
M 2	Ventilator Fan Ventilateur		-----	-----
M 3	Kompressor Stufe 2 Compressor stage 2 Compresseur étage 2		-----	-----
M 4	Pumpenmotor Pump motor Moteur de pompe		EM 062	EM 062
N 1	Anzeige Display Affichage		EAO 098	EAO 098
S 1	Netzschalter Mains switch Interrupteur secteur		EST 083	EST 083
T 1	Trafo Trafo Trafo		EIT 109	EIT 109
X 1	Netzanschluß / Netzkabel Mains connection / Mains cable Branchement secteur / Cable de secteur		EKN 008	EKN 008

An / To / A:

LAUDA Dr. R. Wobser • LAUDA Service Center • Fax: +49 (0) 9343 - 503-222

Von / From / De :

Firma / Company / Entreprise: _____

Straße / Street / Rue: _____

Ort / City / Ville: _____

Tel.: _____

Fax: _____

Betreiber / Responsible person / Personne responsable: _____

Hiermit bestätigen wir, daß nachfolgend aufgeführtes LAUDA-Gerät (Daten vom Typenschild):

We herewith confirm that the following LAUDA-equipment (see label):

Par la présente nous confirmons que l'appareil LAUDA (voir plaque signalétique):

Typ / Type / Type :	Serien-Nr. / Serial no. / No. de série:

mit folgendem Medium betrieben wurde

was used with the below mentioned media

a été utilisé avec le liquide suivant

Darüber hinaus bestätigen wir, daß das oben aufgeführte Gerät sorgfältig gereinigt wurde, die Anschlüsse verschlossen sind, und sich weder giftige, aggressive, radioaktive noch andere gefährliche Medien in dem Gerät befinden.

Additionally we confirm that the above mentioned equipment has been cleaned, that all connectors are closed and that there are no poisonous, aggressive, radioactive or other dangerous media inside the equipment.

D'autre part, nous confirmons que l'appareil mentionné ci-dessus a été nettoyé correctement, que les tubulures sont fermées et qu'il n'y a aucun produit toxique, agressif, radioactif ou autre produit nocif ou dangereux dans la cuve.

Stempel Seal / Cachet.	Datum Date / Date	Betreiber Responsible person / Personne responsable

Formblatt / Form / Formulaire:

Erstellt / published / établi:

Änd.-Stand / config-level / Version:

Datum / date:

Unbedenk.doc

LSC

0.1

30.10.1998

LAUDA DR. R. WOBSE GmbH & Co. KG

Pfarrstraße 41/43

D - 97922 Lauda-Königshofen

Internet: <http://www.lauda.de>

Tel:

+49 (0)9343 / 503-0

Fax:

+49 (0)9343 / 503-222

E-mail:

info@lauda.de